

Part 1– Pending and Allowed Claims

1. (Pending) A device for heat treatment of the prostate of a patient, comprising a treatment catheter with an expandable fluid reservoir containing liquid and first heating means which is located within said treatment catheter and which emits electromagnetic radiation for heating of the surrounding prostatic tissue, said treatment catheter being provided with a free end which is insertable through the urethra into the urinary bladder of the [a] patient and a second end connected to an energy supply unit arranged outside of the patient's body, wherein
second independent heating means is provided in thermal contact with the liquid in the fluid reservoir for heating of the liquid in the fluid reservoir,
10 said fluid reservoir is positioned external to the treatment catheter so that in its operative position it engages with and fills the urethra which extends through the prostate adjacent to the bladder [prostate] neck of the patient, and
 said first heating means and second heating means are operatively connected with the energy supply unit,
15 wherein said first heating means is provided as a coil antenna and said second heating means comprises a lead resistance in said coil antenna.
2. (Pending) A device according to claim 1, wherein said first heating means is provided as an antenna element emitting microwaves and said second heating means also comprises an electric lead resistance connected to said antenna element.
3. (Pending) A device according to claim 2, wherein said second heating means comprises a lead resistance separated from the antenna element and provided axially displaced along the treatment catheter from said first heating means towards the free end of the treatment catheter.
4. (Pending) A device according to claim 1, wherein said energy supply unit comprises a microwave generator for supply of microwave energy to said first heating means and one of a direct current or a low frequency power source for supply of electric energy to said second heating means.

5. (Pending) A device according to claim 4, wherein said first heating means is electrically connected to said second heating means and the microwave generator is operatively connected to said one of the direct current or the low frequency power source for jointly supplying microwave energy and electric energy
5 to said first heating means and said second heating means.

6. (Pending) A device according to claim 4, wherein a first temperature sensor is provided for measuring of temperature in the prostatic tissue and a second temperature sensor is provided for measuring of temperature in the fluid reservoir, and wherein a central control unit operatively connected to said energy supply unit is provided for controlling the supply of microwave energy to said first heating means as a function of the temperature in the prostatic tissue and for controlling the supply of electric energy to said second heating means as a function of the temperature in the fluid reservoir.
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7. (Pending) A device according to claim 1, wherein said energy supply unit is connected to said first heating means and to said second heating means via an electronic unit, and wherein said electronic unit is provided for simultaneous supply of energy to the two heating means.

8. (Pending) A device according to claim 1, wherein said energy supply unit is connected to said first heating means and to said second heating means via an electronic unit, and wherein said electronic unit is provided for non-simultaneous supply of energy to the two heating means.

9. (Pending) A device for heat treatment of the prostate of a patient, comprising a treatment catheter with an expandable fluid reservoir containing liquid and first heating means which is located within said treatment catheter and which emits electromagnetic radiation for heating of the surrounding prostatic tissue, said
5 treatment catheter being provided with a free end which is insertable through the urethra into the urinary bladder of the [a] patient and a second end connected to an energy supply unit arranged outside of the patient's body, wherein
second independent heating means is provided in thermal contact with the liquid in the fluid reservoir for heating of the liquid in the fluid reservoir,

10 said fluid reservoir is positioned external to the treatment catheter so that in its operative position it engages with and fills the urethra which extends through the prostate adjacent to the bladder [prostate] neck of the patient, and

 said first heating means and second heating means are operatively connected with the energy supply unit;

15 said first heating means is provided as an antenna element emitting microwaves and said second heating means comprises an electric lead resistance; and

20 wherein a feed cable connects said energy supply unit to said first heating means and to said second heating means, and wherein said feed cable is provided as a coaxial cable with an inner conductor for supply of microwave energy and electric energy and with a covering acting as a return lead.

10. (Pending) A method according to claim 14, [9,] comprising supplying [supply of] microwave energy to said first heating means simultaneously with supplying [supply of] electric energy to said second heating means.

11. (Pending) A method according to claim 10, comprising
 continually [continual] measuring of the temperature of the prostatic tissue and the liquid in the fluid reservoir, and

5 controlling [control of] the supply of microwave energy as a function of the temperature of the prostatic tissue, and controlling [control of] the supply of electric energy as a function of the temperature of the liquid in the fluid reservoir.

12. (Pending) A method according to claim 14, [9,] comprising supplying [supply of] microwave energy to said first heating means non-concurrently with supplying [supply of] electric energy to said second heating means.

13. (Pending) A device for heat treatment of the prostate of a patient, comprising a treatment catheter with an expandable fluid reservoir containing liquid and first heating means which is located within said treatment catheter and which emits electromagnetic radiation for heating of the surrounding prostatic tissue, said 5 treatment catheter being provided with a free end which is insertable through the

urethra into the urinary bladder of the [a] patient and a second end connected to an energy supply unit arranged outside of the patient's body, wherein

second independent heating means is provided in thermal contact with the liquid in the fluid reservoir for heating of the liquid in the fluid reservoir,

10 said fluid reservoir is positioned external to the treatment catheter so that in its operative position it engages with and fills the urethra which extends through the prostate adjacent to the bladder [prostate] neck of the patient, and

said first heating means and second heating means are operatively connected with the energy supply unit,

15 wherein a feed cable connects said energy supply unit to said first heating means and to said second heating means, and wherein said feed cable is provided as a coaxial cable with an inner conductor for supply of microwave energy and electric energy and with a covering acting as a return lead.

14. (Pending) A method for heat treatment of the prostate of a patient, comprising using a treatment catheter equipped with an expandable fluid reservoir and first heating means which is located within said treatment catheter and which emits electromagnetic radiation for heating of the prostatic urethra as well as the 5 prostatic tissue surrounding the urethra of the patient, wherein said treatment catheter is provided with a free end which is inserted through the urethra into the urinary bladder of the [a] patient, and a second end which is connected to an energy supply unit arranged and used outside of the patient's body, comprising the following steps:

10 operatively connecting [operative connection of] said first heating means to the energy supply unit,

positioning [of] said fluid reservoir externally to the treatment catheter so that in its operative position it will expand and engage with the urethra which extends through the prostate adjacent to the bladder [prostate] neck of the patient,
15 [and]

heating [of] liquid in the fluid reservoir through second heating means which is arranged to be in thermal contact with the liquid separately from said first heating means, [wherein said method comprising]

20 heating [of] deep-lying prostatic tissue through emitting of microwave energy from said first heating means, and

destructing [destruction of] the prostatic urethra, its mucosa and the closest surrounding tissue as well as the bladder neck [base] primarily via direct heating from the liquid through said second heating means.

15. (Pending) A method according to claim 14, further comprising:

arranging the second heating means in thermal contact with the liquid by positioning the second heating means within the fluid reservoir.

16. (Pending) A method according to claim 14, further comprising:

heat treating the deep-lying prostate tissue outward beyond that tissue destructed by heat conduction from the fluid reservoir by emitting electromagnetic radiation.

17. (Pending) A method according to claim 14, further comprising:

expanding the fluid reservoir in radial size relative to adjoining portions of the treatment catheter during the heat treatment of the prostate.

18. (Pending) A method according to claim 17, further comprising:

pressurizing the liquid within the fluid reservoir to expand the fluid reservoir in radial size during the heat treatment of the prostate.

19. (Pending) A method according to claim 17, further comprising:

compressing the surrounding tissue to reduce blood flow through the compressed tissue to reduce the transmission of heat by blood flow away from the compressed tissue.

20. (Pending) A method according to claim 17, further comprising:

compressing the bladder neck to reduce blood flow through the bladder neck to reduce the transmission of heat by blood flow away from the compressed bladder neck.

21. (Pending) A method according to claim 17, further comprising:

destructing the prostatic urethra, its mucosa and the closest surrounding prostate tissue as well as the bladder neck by coagulation primarily from heat conducted from the heated liquid in the fluid reservoir; and

5 destructing the deep-lying prostate tissue outside of the closest surrounding prostate tissue by heat from emitted electromagnetic radiation.

22. (Pending) A method according to claim 17, further comprising:
creating a shell of tissue of larger transverse dimensions than the transverse dimension of the prostatic urethra prior to the heat treatment.

23. (Pending) A method according to claim 17, further comprising:
creating a stent of tissue through the prostate by the heat treatment.

24. (Pending) A method according to claim 17, further comprising:
creating a cavity by the destructed tissue, the cavity having larger transverse dimensions than the transverse dimension of the prostatic urethra prior to the heat treatment.

25. (Pending) A method according to claim 14, further comprising:
transmitting heat to the liquid in the fluid reservoir from both the first and second heating means.

26. (Pending) A method according to claim 14, further comprising:
transmitting heat to the liquid in the fluid reservoir from electromagnetic radiation emitted from the first heating means and transmitting heat to the liquid in the fluid reservoir from heat conduction from the second
5 heating means.

27. (Pending) A method according to claim 26, wherein the first heating means comprises an antenna element for emitting the electromagnetic radiation, and said method further comprises:
transmitting heat to liquid in the fluid reservoir by heat conduction

5 from the antenna element when the antenna element emits electromagnetic radiation.

28. (Pending) A method according to claim 14, wherein the catheter comprises a feed cable extending from the second end to the first heating means,

and the first heating means comprises an antenna element emitting electromagnetic radiation, and said method further comprises:

5 conducting energy from the energy supply unit through the feed cable to the antenna element to cause the antenna element to emit the electromagnetic radiation; and

10 cooling the feed cable by conducting liquid along the feed cable to transfer heat from the feed cable caused by conducting the energy to the antenna element.

29. (Pending) A method according to claim 28, further comprising:

preventing damage to the urethra at locations adjacent to the feed cable and outside of the fluid reservoir by cooling the feed cable by conducting the liquid along the feed cable.

30. (Pending) A method according to claim 14, further comprising:

simultaneously supplying energy to the first and second heating means to heat the liquid within the fluid reservoir.

31. (Pending) A method according to claim 14, further comprising:

measuring temperature of the prostatic tissue,

measuring of temperature of liquid in the fluid reservoir,

controlling the supply of electromagnetic energy to said first heating

5 means as a function of the temperature in the prostatic tissue, and

controlling the supply of electric energy to said second heating means as a function of the temperature of the liquid in the fluid reservoir.

32. (Pending) A method according to claim 14, further comprising:

closing the fluid reservoir to contain the liquid within the fluid reservoir.

33. (Pending) A method according to claim 14, further comprising:

conducting liquid into and out of the fluid reservoir through a channel which extends from the free end of the treatment catheter into the fluid reservoir.

34. (Pending) A method according to claim 14, wherein the treatment catheter further comprises an expandable balloon, and the method further comprises:

5 expanding the expandable balloon within the urinary bladder; and contacting the expandable balloon with the bladder neck to position the treatment catheter in a treatment position in the urethra at which heat from the liquid in the fluid reservoir is transferred directly to the bladder neck.

35. (Pending) A method according to claim 14 comprising heating the liquid in the reservoir to a temperature of at least 60 degrees Celsius.

36. (Pending) A method according to claim 14 comprising diffusing medicine from the fluid reservoir to the adjacent exterior tissue contacted by the fluid reservoir.

37. (Pending) A device according to claim 1 wherein the coil antenna and the lead resistance conduct heat into the liquid within the fluid reservoir.

5 38. (Pending) A device according to claim 1 further comprising a feed cable extending within the treatment catheter from the second end to the first heating means to conduct microwave energy to the first heating means, and a cooling channel located adjacent to the feed cable and extending within the treatment catheter from the second end to a location adjacent to the fluid reservoir.

39. (Pending) A device according to claim 38 wherein liquid in the cooling channel transfers heat from the feed cable resulting from the conduction of microwave energy to the first heating means.

40. (Pending) A device according to claim 2 wherein said electrical lead resistance is also located within the fluid reservoir.

41. (Pending) A device according to claim 9 wherein the electric lead resistance is in the antenna element.

42. (Pending) A device according to claim 13 wherein said first heating means comprises an antenna element emitting microwaves.

43. (Pending) A device according to claim 9 or 42 wherein said antenna element comprises a coil.

44. (Pending) A device according to claim 9 or 13 wherein said second heating means comprises an electrical resistance.

45. (Pending) A device according to claim 44 wherein the electrical resistance is in the antenna element.

46. (Pending) A device according to claim 9 or 13, wherein said energy supply unit comprises a microwave generator for supplying microwave energy to said first heating means and one of a direct current or a low frequency power source for supplying electric energy to said second heating means.

47. (Pending) A device according to claim 46, further comprising:

a first temperature sensor for measuring of temperature of the prostatic tissue;

a second temperature sensor for measuring of temperature of liquid in the fluid reservoir; and

a central control unit operatively connected to said energy supply unit for controlling the microwave energy supplied to said first heating means as a function of the temperature in the prostatic tissue and for controlling the electric energy supplied to said second heating means as a function of the temperature of the liquid in the fluid reservoir.

48. (Pending) A device according to claim 9 or 13 wherein the feed cable extends within the treatment catheter from the second end to the first and second heating means by which to conduct the microwave energy to the first heating means and the electrical energy to the second heating means, and the treatment

5 catheter further comprises a cooling channel located adjacent to the feed cable and extending within the treatment catheter from the second end to a location adjacent to the fluid reservoir.

49. (Pending) A device according to claim 48 wherein liquid in the cooling channel transfers heat from the feed cable resulting from the conduction of microwave energy to the first heating means.

50. (Pending) A device according to claim 1, 9 or 13, wherein the operative position of the fluid reservoir is an expansion in radial size of the fluid reservoir relative to adjoining portions of the treatment catheter.

51. (Pending) A device according to claim 50, wherein the expansion in size results from pressurizing the liquid within the fluid reservoir.

52. (Pending) A device according to claim 50, wherein the expansion in radial size of the fluid reservoir is sufficient to compress the surrounding tissue to reduce blood flow through the compressed tissue and thereby reduce the transmission of heat by blood flow away from the compressed tissue.

53. (Pending) A device according to claim 52, wherein the surrounding tissue which is compressed to reduce blood flow includes the bladder neck.

54. (Pending) A device according to claim 52, wherein the surrounding tissue which is compressed to reduce blood flow includes the prostate tissue surrounding the prostatic urethra adjacent to the bladder neck.

55. (Pending) A device according to claim 1, 9 or 13, wherein the fluid reservoir is closed to contain the liquid within the fluid reservoir.

56. (Pending) A device according to claim 1, 9 or 13, wherein the treatment catheter further comprises a balloon which is expandable within the urinary bladder to position the treatment catheter in a treatment position in the urethra at which heat from the liquid in the fluid reservoir is transferred directly to the bladder neck.

57. (Pending) A device according to claim 56, wherein the first heating means is located in the treatment catheter to emit radiation to heat prostate tissue when the treatment catheter is in the treatment position.

58. (Pending) A device according to claim 1, 9 or 13, wherein said energy supply unit supplies energy to the first heating means separately from energy supplied to the second heating means.

59. (Pending) A device according to claim 1, 9 or 13, wherein the treatment catheter comprises a channel extending from the fluid reservoir to the second end of the treatment catheter by which to conduct the liquid into and out of the fluid reservoir.

60. (Pending) A device according to claim 1, 9 or 13, wherein the first and second heating means have the capacity to heat the liquid in the reservoir to a temperature of at least 60 degrees Celsius.

61. (Pending) A device according to claim 1, 9 or 13, wherein the first heating means has the capacity to treat tissue by heat created from emitted electromagnetic radiation at a greater distance from the treatment catheter than the heated liquid in the fluid reservoir has the capacity to treat tissue by heat conducted from the liquid in the fluid reservoir.

5 62. (Pending) A device according to claim 1, 9 or 13, wherein the fluid reservoir is defined by an exterior wall, and the exterior wall permits diffusion of medicine within the liquid within the fluid reservoir through the wall to the exterior tissue.

63. (Pending) A catheter for insertion into a urethra to perform a therapeutic heat treatment of a prostate which surrounds a prostatic urethra to enlarge a urine drainage passage through the prostate from a urinary bladder into a urethra of a human being, comprising:

5 an antenna located at a position within the catheter adjacent to the prostatic urethra and the prostate upon insertion of the catheter into the urethra to a treatment position at which the treatment is performed, the antenna for emitting electromagnetic radiation into the prostate to heat therapeutically with the emitted radiation a portion of the prostate surrounding a portion of the prostatic urethra;

10 an expandable reservoir within the catheter surrounding the antenna and located to extend along a portion of the prostatic urethra upon positioning the catheter in the treatment position, the reservoir for containing liquid and expanding in radial size relative to adjoining portions of the catheter upon pressurizing the liquid within the reservoir, the extent of radial expansion of the reservoir being

15 sufficient to compress tissue adjacent to the reservoir and reduce blood flow through the compressed tissue to reduce the transmission of heat by blood flow away from the compressed tissue;

the expandable reservoir confining the liquid to absorb heat from the antenna and from a portion of the electromagnetic radiation emitted from the antenna, the reservoir having a capacity for conductively transmitting sufficient heat from the liquid to heat therapeutically a first region of tissue immediately adjoining the expanded reservoir, the reservoir and the liquid having a capacity for transmitting sufficient electromagnetic radiation emitted from the antenna to heat therapeutically a second region of tissue located beyond the first region from the reservoir, the capacity for therapeutically heating the first and second tissue regions being sufficient to cause tissue necrosis in the first and second regions and enlarge the urine drainage passage; and

a channel extending within the catheter from a position at an exterior of the urethra and communicating with the expandable reservoir for conducting pressurized liquid into the reservoir.

64. (Pending) A catheter as defined in claim 63, wherein:

the heat capacity of the expanded reservoir and the conductive transmission of heat from the liquid within the reservoir establishes the extent of the first region of therapeutically heated tissue.

65. (Pending) A catheter as defined in claim 63, also used to therapeutically heat treat a bladder neck which surrounds the prostatic urethra extending from the urinary bladder to increase the size of the urine drainage passage, wherein:

the expandable reservoir is located to directly contact the bladder neck when the catheter is in the treatment position; and

the reservoir has a capacity for conductively transmitting sufficient heat from the liquid to heat the bladder neck therapeutically and cause an enlargement of the bladder neck for the urine passageway.

66. (Pending) A catheter as defined in claim 63, further comprising:

a feed cable extending within the catheter from a position at the exterior of the urethra and connecting to the antenna to conduct energy to the

5 antenna, the feed cable emitting heat as a result of conducting the energy to the antenna; and

a cooling channel within the catheter and extending along the feed cable, the cooling channel for conducting liquid to remove heat emitted by the feed cable and to protect the urethra and the tissue surrounding the feed cable from heat from the feed cable when the catheter is in the treatment position.

67. (Pending) A catheter as defined in claim 66, wherein:

the cooling channel extending along the feed cable and the channel communicating with the expandable reservoir are separate from one another.

68. (Pending) A catheter as defined in claim 66, wherein:

the expandable reservoir is separated from the cooling channel.

69. (Pending) A catheter as defined in claim 66, wherein:

the expandable reservoir prevents circulation of the liquid in the reservoir.

70. (Pending) A catheter for insertion into a urethra to perform a therapeutic heat treatment of a prostate which surrounds a prostatic urethra to enlarge a urine drainage passage through the prostate from a urinary bladder into a urethra of a human being, comprising:

5 an antenna located at a position within the catheter adjacent to the prostatic urethra and the prostate upon insertion of the catheter into the urethra to a treatment position at which the treatment is performed, the antenna for emitting electromagnetic radiation into the prostate to heat therapeutically with the emitted radiation a portion of the prostate surrounding a portion of the prostatic urethra;

10 an expandable reservoir within the catheter surrounding the antenna and located to extend along a portion of the prostatic urethra upon positioning the catheter in the treatment position, the reservoir for containing liquid and expanding in radial size relative to adjoining portions of the catheter upon pressurizing the liquid within the reservoir, the extent of radial expansion of the reservoir being sufficient to compress tissue adjacent to the reservoir and reduce blood flow

through the compressed tissue to reduce the transmission of heat by blood flow away from the compressed tissue;

the expandable reservoir confining the liquid to absorb heat from the antenna and from a portion of the electromagnetic radiation emitted from the

20 antenna, the reservoir having a capacity for conductively transmitting sufficient heat from the liquid to heat therapeutically a first region of tissue immediately adjoining the expanded reservoir, the reservoir and the liquid having a capacity for transmitting sufficient electromagnetic radiation emitted from the antenna to heat therapeutically a second region of tissue located beyond the first region from the

25 reservoir, the capacity for therapeutically heating the first and second tissue regions being sufficient to enlarge the urine drainage passage;

a channel extending within the catheter from a position at an exterior of the urethra and communicating with the expandable reservoir for conducting pressurized liquid into the reservoir; and

30 a liquid temperature sensor positioned within the reservoir to sense the temperature of liquid within the reservoir.

71. (Pending) A catheter as defined in claim 63, further comprising:

a tissue temperature sensor connected to the catheter to sense the temperature of the tissue surrounding the reservoir.

72. (Pending) A catheter for insertion into a urethra to perform a therapeutic heat treatment of a prostate which surrounds a prostatic urethra to enlarge a urine drainage passage through the prostate from a urinary bladder into a urethra of a human being, comprising:

5 an antenna located at a position within the catheter adjacent to the prostatic urethra and the prostate upon insertion of the catheter into the urethra to a treatment position at which the treatment is performed, the antenna for emitting electromagnetic radiation into the prostate to heat therapeutically with the emitted radiation a portion of the prostate surrounding a portion of the prostatic urethra;

10 an expandable reservoir within the catheter surrounding the antenna and located to extend along a portion of the prostatic urethra upon positioning the

catheter in the treatment position, the reservoir for containing liquid and expanding in radial size relative to adjoining portions of the catheter upon pressurizing the liquid within the reservoir, the extent of radial expansion of the reservoir being

15 sufficient to compress tissue adjacent to the reservoir and reduce blood flow through the compressed tissue to reduce the transmission of heat by blood flow away from the compressed tissue;

the expandable reservoir confining the liquid to absorb heat from the antenna and from a portion of the electromagnetic radiation emitted from the

20 antenna, the reservoir having a capacity for conductively transmitting sufficient heat from the liquid to heat therapeutically a first region of tissue immediately adjoining the expanded reservoir, the reservoir and the liquid having a capacity for transmitting sufficient electromagnetic radiation emitted from the antenna to heat therapeutically a second region of tissue located beyond the first region from the

25 reservoir, the capacity for therapeutically heating the first and second tissue regions being sufficient to enlarge the urine drainage passage;

a channel extending within the catheter from a position at an exterior of the urethra and communicating with the expandable reservoir for conducting pressurized liquid into the reservoir;

30 a carrier moveably positioned within the catheter, the carrier having a tip which penetrates into the prostate at a radial distance relative to the expandable reservoir upon extension of the carrier from the catheter when the catheter is in the treatment position; and

a tissue temperature sensor connected to the carrier to sense the

35 temperature of the prostate tissue surrounding the reservoir at distance away from the expandable reservoir.

73. (Pending) A catheter as defined in claim 72, wherein:

the tissue temperature sensor is connected to the carrier at a position which measures the temperature of the second tissue region.

74. (Pending) A catheter as defined in claim 72, wherein:

the carrier includes a plurality of the temperature sensors connected at positions which measure the temperature of the prostate at a plurality of different distances away from the expandable reservoir.

75. (Pending) A catheter for insertion into a urethra to perform a therapeutic heat treatment of a prostate which surrounds a prostatic urethra to enlarge a urine drainage passage through the prostate from a urinary bladder into a urethra of a human being, comprising:

5 an antenna located at a position within the catheter adjacent to the prostatic urethra and the prostate upon insertion of the catheter into the urethra to a treatment position at which the treatment is performed, the antenna for emitting electromagnetic radiation into the prostate to heat therapeutically with the emitted radiation a portion of the prostate surrounding a portion of the prostatic urethra;

10 an expandable reservoir within the catheter surrounding the antenna and located to extend along a portion of the prostatic urethra upon positioning the catheter in the treatment position, the reservoir for containing liquid and expanding in radial size relative to adjoining portions of the catheter upon pressurizing the liquid within the reservoir, the extent of radial expansion of the reservoir being sufficient to compress tissue adjacent to the reservoir and reduce blood flow through the compressed tissue to reduce the transmission of heat by blood flow away from the compressed tissue;

15 the expandable reservoir confining the liquid to absorb heat from the antenna and from a portion of the electromagnetic radiation emitted from the antenna, the reservoir having a capacity for conductively transmitting sufficient heat from the liquid to heat therapeutically a first region of tissue immediately adjoining the expanded reservoir, the reservoir and the liquid having a capacity for transmitting sufficient electromagnetic radiation emitted from the antenna to heat therapeutically a second region of tissue located beyond the first region from the reservoir, the capacity for therapeutically heating the first and second tissue regions being sufficient to enlarge the urine drainage passage;

a channel extending within the catheter from a position at an exterior of the urethra and communicating with the expandable reservoir for conducting pressurized liquid into the reservoir; and

30 a source of additional heat for the liquid within the expandable reservoir beyond the heat from the antenna and from the emitted electromagnetic radiation.

76. (Pending) A catheter as defined in claim 75, wherein:

the additional heat source is located within the expandable reservoir.

77. (Pending) A catheter as defined in claim 75, wherein:

the additional heat source comprises an electrical resistance separate from the antenna.

78. (Pending) A catheter as defined in claim 77, further comprising:

a feed cable extending within the catheter from a position at the exterior of the urethra and connecting to the antenna and to the electrical resistance to conduct energy to the antenna and to the electrical resistance.

79. (Pending) A catheter as defined in claim 78, wherein:

the feed cable emits heat as a result of conducting the energy to the antenna; and further comprising:

a cooling channel within the catheter and extending along the feed

5 cable, the cooling channel for conducting liquid to remove heat emitted by the feed cable and to protect the urethra and the tissue surrounding the feed cable from heat from the feed cable when the catheter is in the treatment position.

80. (Pending) A catheter as defined in claim 63, in combination with an energy supply unit, the energy supply unit comprising:

a microwave generator for generating electromagnetic energy and electrically connected to the antenna at a position exterior of the urethra; and

5 a liquid supply device connected to the channel at a position exterior of the urethra to supply liquid through the channel to fill the reservoir with liquid and to pressurize the liquid within the reservoir to expand the reservoir; and wherein:

the antenna emits electromagnetic radiation from the application of the electromagnetic energy generated by the microwave generator and generates
10 heat in the liquid in the reservoir as a result of emitting the electromagnetic radiation.

81. (Pending) A catheter for insertion into a urethra to perform a therapeutic heat treatment of a prostate which surrounds a prostatic urethra to enlarge a urine drainage passage through the prostate from a urinary bladder into a urethra of a human being, in combination with an energy supply unit, the catheter
5 comprising:

an antenna located at a position within the catheter adjacent to the prostatic urethra and the prostate upon insertion of the catheter into the urethra to a treatment position at which the treatment is performed, the antenna for emitting electromagnetic radiation into the prostate to heat therapeutically with the emitted
10 radiation a portion of the prostate surrounding a portion of the prostatic urethra;

an expandable reservoir within the catheter surrounding the antenna and located to extend along a portion of the prostatic urethra upon positioning the catheter in the treatment position, the reservoir for containing liquid and expanding in radial size relative to adjoining portions of the catheter upon pressurizing the
15 liquid within the reservoir, the extent of radial expansion of the reservoir being sufficient to compress tissue adjacent to the reservoir and reduce blood flow through the compressed tissue to reduce the transmission of heat by blood flow away from the compressed tissue;

the expandable reservoir confining the liquid to absorb heat from the
20 antenna and from a portion of the electromagnetic radiation emitted from the antenna, the reservoir having a capacity for conductively transmitting sufficient heat from the liquid to heat therapeutically a first region of tissue immediately adjoining the expanded reservoir, the reservoir and the liquid having a capacity for transmitting sufficient electromagnetic radiation emitted from the antenna to heat
25 therapeutically a second region of tissue located beyond the first region from the

reservoir, the capacity for therapeutically heating the first and second tissue regions being sufficient to enlarge the urine drainage passage; and

30 a channel extending within the catheter from a position at an exterior of the urethra and communicating with the expandable reservoir for conducting pressurized liquid into the reservoir; and the energy supply unit comprising:

a microwave generator for generating electromagnetic energy and electrically connected to the antenna at a position exterior of the urethra; and

a liquid supply device connected to the channel at a position exterior of the urethra to supply liquid through the channel to fill the reservoir with liquid and

35 to pressurize the liquid within the reservoir to expand the reservoir; and wherein:

the antenna emits electromagnetic radiation from the application of the electromagnetic energy generated by the microwave generator and generates heat in the liquid in the reservoir as a result of emitting the electromagnetic radiation; and further comprising:

40 a source of additional heat for the liquid within the expandable reservoir beyond the heat from the antenna and from the emitted electromagnetic radiation; and wherein:

the energy supply unit further comprises a source of energy for the second heat source.

82. (Pending) A combination as defined in claim 81, wherein:

the additional heat source is located in the expandable reservoir and generates heat in response to the application of electrical energy to the additional heat source; and

5 the energy supply unit further comprises an electrical energy generator connected to the additional heat source to supply electrical energy to the additional heat source.

83. (Pending) A combination as defined in claim 82, wherein the catheter further comprises:

a feed cable connected to the microwave generator and the electrical energy generator, the feed cable extending from a position exterior of the urethra

5 within the catheter and connecting to the antenna and the additional heat source to conduct microwave energy to the antenna and to conduct the electrical energy to the additional source, the feed cable emitting heat as a result of conducting the microwave energy to the antenna; and
 a cooling channel within the catheter and extending along the feed

10 cable; and wherein the energy supply unit further comprises:
 a source of liquid connected to the cooling channel for conducting liquid through the cooling channel to remove heat from the feed cable and protect the urethra and the tissue surrounding the feed cable from heat from the feed cable when the catheter is in the treatment position.

 84. (Pending) A method of performing a therapeutic heat treatment of a prostate which surrounds a prostatic urethra to enlarge a urine drainage passage through the prostate from a urinary bladder into a urethra of a human being, comprising:

5 inserting into the urethra a catheter having an electromagnetic radiation emitting antenna surrounded by an expandable reservoir;
 positioning the catheter in the urethra in a treatment position where the antenna and the reservoir are adjacent to the prostatic urethra and the prostate which are to be therapeutically heat treated;

10 filling the expandable reservoir with liquid;
 expanding the expandable reservoir in radial size relative to adjoining portions of the catheter by pressurizing the liquid within the reservoir;
 expanding the expandable reservoir sufficiently to compress tissue adjacent to the reservoir and reduce blood flow through the compressed tissue to

15 reduce the transmission of heat by blood flow away from the compressed tissue;
 energizing the antenna to emit electromagnetic radiation;
 absorbing heat within the liquid in the reservoir from the antenna and from a portion of the electromagnetic radiation emitted from the antenna;
 increasing the temperature of the liquid in the reservoir to a

20 therapeutic level;

applying heat from the liquid within the reservoir to a portion of the prostatic urethra and a portion of the prostate surrounding the prostatic urethra;

conducting sufficient heat from the liquid to heat therapeutically a first region of tissue immediately adjoining the expanded reservoir, the first region including the portion of the prostatic urethra and the prostate immediately surrounding the portion of the prostatic urethra;

emitting sufficient electromagnetic radiation from the antenna to heat therapeutically in a second region of tissue located beyond the first region from the reservoir; and

enlarging the urine drainage passage by therapeutically heating the first and second tissue regions.

85. (Pending) A method as defined in claim 84, further comprising:
establishing the extent of the first region by the amount of heat conducted from the liquid in the reservoir and the extent of contraction of the tissue resulting from expansion of the reservoir.

86. (Pending) A method as defined in claim 84, also used to therapeutically heat treat a bladder neck which surrounds the prostatic urethra extending from the urinary bladder to increase the size of the urine drainage passage, further comprising:

directly contacting the bladder neck with the reservoir;
compressing the bladder neck sufficiently to reduce blood flow from the bladder neck; and

conducting sufficient heat from the liquid to heat the bladder neck therapeutically immediately adjoining the expanded reservoir to enlarge the urine drainage passage through the bladder neck.

87. (Pending) A method as defined in claim 86, further comprising:
conducting sufficient heat from the liquid to coagulate at least a portion of the bladder neck adjoining the expanded reservoir.

88. (Pending) A method as defined in claim 84, further comprising:

conducting sufficient heat from the liquid to coagulate tissue in the first region.

89. (Pending) A method as defined in claim 88, further comprising:
emitting sufficient electromagnetic radiation from the antenna to coagulate tissue in the second region.

90. (Pending) A method as defined in claim 84, further comprising:
emitting sufficient electromagnetic radiation from the antenna to coagulate tissue in the second region.

91. (Pending) A method as defined in claim 84, further comprising:
heating therapeutically the tissue in the first and second regions to create a shell of tissue surrounding the expanded urine drainage passage.

92. (Pending) A method as defined in claim 84, further comprising:
heating therapeutically the tissue in the first and second regions to create a stent from tissue surrounding the expanded urine drainage passage.

93. (Pending) A method as defined in claim 84, further comprising:
heating therapeutically the tissue in the first and second regions to destroy sufficient tissue to create a cavity within the remaining tissue which forms the expanded urine drainage passage.

94. (Pending) A method as defined in claim 84, further comprising:
heating the liquid in the reservoir to a temperature of at least 60 degrees Celsius.

95. (Pending) A method as defined in claim 84, further comprising:
defusing medicine from the fluid reservoir to the tissue contacting the reservoir.

96. (Pending) A method as defined in claim 84, further comprising:
adding additional heat to the liquid beyond that heat absorbed from the antenna and from the emitted electromagnetic radiation.

97. (Pending) A method as defined in claim 96, further comprising:
adding the additional heat within the expandable reservoir.

98. (Pending) A method as defined in claim 97, wherein:

the catheter used comprises an electrically energized heat source within the expandable reservoir, the electrically energized heat source being separate from the antenna, the catheter also comprising a feed cable extending from a position exterior of the urethra within the catheter and connecting to the antenna and to the heat source to conduct energy to the antenna and to the heat source, the feed cable emitting heat as a result of conducting energy to the antenna, the catheter also comprising a cooling channel extending along the feed cable;

10 conducting energy to the antenna and to the heat source through the feed cable;

conducting liquid through the cooling channel to remove heat from the feed cable caused by conducting the energy to the antenna; and

protecting the urethra and the tissue surrounding the feed cable from

15 heat from the feed cable.

99. (Pending) A method as defined in claim 98, further comprising:

measuring the temperature of the liquid in the reservoir;

measuring the temperature of the prostate in the second region; and

separately controlling the relative amounts of energy delivered to the

5 antenna and to the heat source relative to the measured temperatures of the liquid in the reservoir and of the tissue in the second region, respectively.

100. (Pending) A method as defined in claim 84, wherein:

the catheter used comprises a feed cable extending from a position exterior of the urethra within the catheter and connecting to the antenna to conduct energy to the antenna, the feed cable emitting heat as a result of conducting

5 energy to the antenna, the catheter also comprising a cooling channel extending along the feed cable; and the method further comprises:

conducting energy to the antenna through the feed cable;

conducting liquid through the cooling channel to remove heat from

the feed cable caused by conducting the energy to the antenna; and

10 protecting the urethra and the tissue surrounding the feed cable from heat from the feed cable.

101. (Pending) A method as defined in claim 98 or 100, wherein:
 the catheter used further comprises a channel extending from a position exterior of the urethra within the catheter and communicating with the reservoir; and the method further comprises:

5 filling the reservoir with liquid through the channel; and
 pressurizing the liquid within the reservoir by applying pressure through the channel.

102. (Pending) A method as defined in claim 101, further comprising:
 separating the liquid conducted in the cooling channel from the liquid in the channel communicating with the reservoir.

103. (Pending) A method as defined in claim 101, further comprising:
 containing the liquid in the reservoir separately from the liquid in cooling channel.

104. (Pending) A method as defined in claim 84, further comprising:
 positioning a liquid temperature sensor within the reservoir to sense the temperature of liquid within the reservoir.

105. (Pending) A method as defined in claim 84, further comprising:
 positioning a tissue temperature sensor in the prostate to sense the temperature of the tissue surrounding the reservoir.

106. (Pending) A method as defined in claim 105, wherein:
 the catheter used comprises a carrier moveably positioned within the catheter to extend from the catheter and penetrate into the prostate at a distance from the reservoir, the tissue temperature sensor connected to the carrier to contact the penetrated prostate upon extending the carrier from the catheter;
 penetrating the carrier into the prostate; and
 measuring the temperature of the prostate with the tissue temperature sensor connected to the carrier at a distance from the reservoir.

107. (Pending) A method as defined in claim 106, further comprising:

measuring the temperature of the prostate tissue in the second region with the tissue temperature sensor.

108. (Pending) A method as defined in claim 107, wherein:

the catheter used comprises a plurality of the tissue temperature sensors positioned on the carrier; and

penetrating the carrier into the prostate to position the plurality of tissue temperature sensors to measure the temperature of the prostate at a plurality of different distances from the reservoir.

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